DP Barcode: D157321

Shaughnessy No.: 105501

Date out of EFGWB: APR 23 1992

TO: L. Rossi/C. Peterson
Product Manager #50
Registration Division (H7505C)

FROM: Paul Mastradone, Ph.D., Chief
Environmental Chemistry Review Section #1
Environmental Fate and Ground Water Branch

THRU: Hank Jacoby, Chief
Environmental Fate and Ground Water Branch
Environmental Fate and Effects Division (H7507C)

Attached, please find the EFGWB review of ...

Reg./File #: 62719-109

Chemical Name: N-[5-(1,1-dimethylethyl)1,3,4-thiadiazol-2-yl]-N'-N'-dimethyl-urea

Type Product: Herbicide

Common Name: Tebuthiuron

Company Name: DowElanco

Purpose: To review an aquatic field dissipation protocol

Date Received: 8 May 1991 Date Completed: 11 May 1991

Action Code: 665

EFGWB #(s): 91-0072

Total Reviewing Time: 0.4 day

Deferrals to: ___Ecological Effects Branch, EFED

___Science Integration and Policy Staff, EFED

___Non-Dietary Exposure Branch, HED

___Dietary Exposure Branch, HED

___Toxicology Branch

1. CHEMICAL:

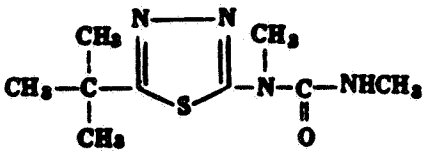
Chemical name: N-[5-(1,1-dimethylethyl)1,3,4-thiadiazol-2-yl]-N'-N'-dimethylurea

CAS no.: 34014-18-1

Common name: Tebuthiuron

Trade name: Spike

Chemical structure:



Physical/Chemical properties of active ingredient:

Physical characteristics: White crystalline, odorless powder, colorless solid

Molecular formula: $C_9H_{16}ON_4S$

Molecular weight: 228

Melting point: 161.5 to 164°C

Vapor Pressure: 2×10^{-6} mm Hg (25°C)

Solubility: 2.5 ppm (25°C, pH 7)

Log octanol/water partition coefficient: 1.79

2. TEST MATERIAL:

N/A

3. STUDY/ACTION TYPE:

To review an aquatic field dissipation protocol

4. STUDY IDENTIFICATION:

Stone, C.T. PROTOCOL FOR AN AQUATIC FIELD DISSIPATION STUDY OF TEBUTHIURON STUDY SITES: PIERCE, TEXAS AND VAN WERT, OHIO. Prepared by The Johnson Company, Inc., Montpelier, VT; Submitted by DowElanco, Greenfield, IN; Document completed September 1990; Received by EPA October 1990.

5. REVIEWED BY:

Gail Maske
Chemist, Review section #1
OPP/EFED/EFGWB

Signature: _____
Date: APR 23 ...

6. APPROVED BY:

Paul Mastradone
Chief
Review section #1
OPP/EFED/EFGWB

Signature: _____
APR 23 ...
Date: _____

7. CONCLUSIONS:

The registrant, DowElanco, is submitting an aquatic field dissipation protocol for review prior to initiating an aquatic field dissipation study to full the data requirement for registration. Based on a review of the submitted protocol, the following should be included in an acceptable study:

a. Storage stability data using either spiked field or spiked laboratory samples to determine the stability of tebuthiuron and its residues under storage conditions described in study must be furnished.

b. Sampling intervals must be adequate to determine half-lives of parent and major degradates under field conditions.

c. The formation and decline of degradates and parent must be fully addressed.

d. Sample preparation (e.g. extractions, etc.) and analytical methodology must be described in detail.

In addition, the registrant should bear in mind that in a supplemental aquatic field dissipation study previous submitted, tebuthiuron degraded in water with a reported half-life of between 77 and 170 days. However, dissipation was negligible after 64 days. Therefore, first order dissipation probably does not accurately indicate the half-life. The actual half-life of tebuthiuron may be greater than reported in the supplemental data. The registrant should satisfactorily address any such observation in the new study.

8. RECOMMENDATIONS:

The registrant should be informed of the following:

a. The protocol for the aquatic field dissipation study (164-2) appears to adequately reflect the guidelines. However, EFGWB does require the above data be included in an acceptable study.

b. The status of the Environmental Fate Data Requirements for tebuthiuron for terrestrial food crop uses and aquatic non-food uses is summarized below:

Environmental Fate Data Requirements		Status of data Requirement	MRID No.
Degradation Studies-lab			
161-1	Hydrolysis	Fulfilled (Reg. Std;01/15/87)	00020779
161-2	Photodegradation in water	Presently in Review	41305101
161-3	Photodegradation on soil	Fulfilled (RJM;09/07/91)	41050201
161-1	Photodegradation in air	Not Submitted[1]	
Metabolism Studies-lab			
162-1	Aerobic soil	Presently in Review	41328001
162-2	Anaerobic soil	Presently in Review[2]	41328002
162-3	Anaerobic aquatic	Not Submitted	
162-4	Aerobic aquatic	Presently in Review	41372501
Mobility Studies			
163-1	Leaching, Adsorption/ Desorption	Partially[3] (PO;11/07/88)	40768401
163-2	Volatility-Lab	Not Submitted[1]	
163-3	Volatility-field	Not Submitted[1]	
Dissipation Studies-field			
164-1	Soil	Not Submitted[4]	
164-2	Aquatic (sediment)	Protocol submitted (WGM;05/12/91)	
164-5	Soil, long-term	Reserved[5]	
Accumulation Studies			
165-1	Confined rotational crops	Not Submitted[6]	
165-4	in Fish	Not Submitted	
Ground-Water Monitoring Studies			
166-2	Small-Scale ground-water Retrospective	Not Submitted	

[1] Based on the low vapor pressure (2×10^{-6} mm Hg) and a toxicological classification of 3, there is sufficient data to support a waiver request for the photodegradation in air, volatility-lab, and volatility-field studies.

[2] An acceptable anaerobic aquatic metabolism study will fulfill the anaerobic metabolism data requirement.

[3] The mobility data requirement for only one metabolite, (N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N-methylurea, has been fulfilled. Mobility data should be submitted for the following degradates, as well:

N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N'-methylurea
5-(1,1-dimethylethyl)-2-methylamino-1,3,4-thiadiazol
5-(1,1-dimethylethyl)-2 amino-1,3,4-thiadiazol
N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N-methyl-N'-hydroxymethyl-urea

The mobility data requirement for unaged tebuthiuron has been fulfilled.

[4] The field dissipation study is needed to understand the routes of dissipation of tebuthiuron in the environment. The study should address EFGWB's three concerns (persistent, mobility, and method of dissipation).

[5] The long-term soil dissipation study (164-5) is reserved until evaluation of an acceptable soil dissipation study (164-1).

[6] If there are no field and vegetable crop, aquatic crop, and rotated food crop uses, the confined rotational crops study is not needed.

9. BACKGROUND:

Tebuthiuron is a relatively nonselective herbicide used for the control of broadleaf weeds, grasses, brush, and for spot treatment of woody brush. Tebuthiuron is readily absorbed through roots of broadleaf weeds, grasses, and brush. Application is by broadcast ground or aerial equipment, spot treatment, drop zone or drop zone treatment with a maximum application rate of 6 lb ai/A.

Tebuthiuron is practically non-toxic to birds, fish, honeybees, and aquatic invertebrates.

10. DISCUSSION:

Spike 40P will be applied to two representative sites, Pierce,TX and Van Wert, OH. The application rate will be 6 lbs ai/acre which is the maximum application rate given on the label. In order to ensure that tebuthiuron is uniformally applied across the target area, the application will be done manually using a calibrated hand operated cyclone spreader. The use of standard mechanized equipment may run the risk

of non-uniform application, due to steep slopes adjacent to the ditch. In addition, to ensure the test material reaches the ground surface, all grass will be mowed to a height of one foot or less. The grass clippings will be removed if they form a mat that is of sufficient thickness to prevent the Spike 40P from reaching the ground surface.

Tebuthiuron is generally applied when runoff is at a minimum. Therefore, the application time will be fall/early winter 1990 to reflect this practice.

Each site will be characterized in terms of soils, hydrology, geology, and meteorology. The test system for each site will be clearly defined in terms of surface water, soil, and stream bed sediment which will each be monitored for tebuthiuron and its residues. In addition, weather and flow will be monitored.

The existing soil characterization will be composed of three major steps.

1. Examining the soils across each study plot using a soil auge to determine the amount of variability in the soils on each plot.
2. Digging soil pits and describing the soils according to standard U.S. Department of Agriculture methodology.
3. Sampling the soil horizons for laboratory analysis. Laboratory analysis will include organic matter content, particle size analysis, bulk density, moisture contents at 1/3 and 15 bar, cation exchange capacity, pH, and other parameters.

An in-stream flow measuring device and/or a rating curve will be used to provide volumetric flow rate data. A measuring point will be approximately 50 feet downstream of the downstream edge of the application area and will be fully operational prior to application of herbicide. A second measuring point will be installed approximately 50 to 100 ft upstream of the application area. The flow measuring technique will incorporate a stilling well equipped with a continuous water level recorder.

The water sampling will be set up using an automatic sampler. This will ensure that when a runoff event occurs at a time when the site technician cannot be present, water quality data will be collected.

The soil sampling in the treated area will be conducted on eight occasions (one pretreatment, and 0, 30, 60, 120, 180, 270, and 365 posttreatment). The location of each soil core sample will be facilitated by dividing both 1000 foot application strips into seven and eight sections, respectively, for a total of 15 sections. The samples will be collected to a depth of 12 inches.

The stream bottom sediment will be sampled at each study location site downstream and upstream of the application area. Sampling will occur at identified deposit areas, as well. Three to five sampling zones will be identified, including one upstream of the sampling area. Each sampling zone will be sampled at three locations to a depth of three locations to a depth of three inches using a hand held coring device. The stream bottom sediment will be collected at the same frequency as the soil samples (pretreatment and 0, 30, 60, 120, 180, 270, and 365 days posttreatment).

Soil samples will be analyzed by HPLC. The procedure utilizes a limit of 0.005 ppm, and a limit of quantification of 0.010 ppm.

11: COMPLETION OF ONE-LINER:

See attached one-liner.

12: CBI APPENDIX:

N/A

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
TEBUTHIURON
Last Update on January 17, 1990
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Common Name:TEBUTHIURON
Smiles Code:s(c(n1)C(C)(C)C)c(n1)N(C(=O)NC)C
PC Code # :105501 CAS #:34014-18-1 Caswell #:

Chem. Name :N-[5-(1,1-DIMETHYLETHYL)-1,3,4-THIADIAZOL-2-YL]-
N',N'-DIMETHYLUREA
Action Type:Herbicide

Trade Names: SPIKE; GRASLAN
(Formul'tn): WP 80%, 40% PELLET; DRY FLOWABLE 20% PELLET, 6% GRANULE
Physical State:

Use : FOR TOTAL VEGETATION WOODY PLANT CONTROL IN NONCROPLAND
Patterns :AREAS AND FOR SPOT TREEATMENT IN PASTURES.
(% Usage) :
:

Empirical Form: $C_9H_{16}N_4OS$
Molecular Wgt.: 228.31 Vapor Pressure: 2.00E -6 Torr
Melting Point : °C Boiling Point: °C
Log Kow : 1.79 pKa: @ °C
Henry's : E Atm. M3/Mol (Measured) 2.40E-10 (calc'd)

Solubility in ...					Comments
Water	2.50E	3	ppm	@20.0 °C	
Acetone	E		ppm	@ °C	
Acetonitrile	E		ppm	@ °C	
Benzene	E		ppm	@ °C	
Chloroform	E		ppm	@ °C	
Ethanol	E		ppm	@ °C	
Methanol	E		ppm	@ °C	
Toluene	E		ppm	@ °C	
Xylene	E		ppm	@ °C	
	E		ppm	@ °C	
	E		ppm	@ °C	

Hydrolysis (161-1)
[ ] pH 5.0:
[ ] pH 7.0:
[V] pH 9.0:>64 DA
[V] pH 3.0:>64 DA
[V] pH 6.0:>64 DA
[ ] pH :

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Photolysis (161-2, -3, -4)
[ ] Air :
[V] Soil : 39.7 DAYS ON SANDY LOAM
[S] Water:RESISTANT; A 25 PPM SOLN
[ ] :WAS ONLY DEGRADED 2% AFTER
[ ] :23 DAYS EXPOSURE TO BLACK
[ ] :LIGHT.

Aerobic Soil Metabolism (162-1)
[S] IN LOAM SOIL AFTER 273 DAYS,
[ ] CONC. DECREASED FROM INITIAL
[ ] 8 PPM TO 5.7 PPM
[ ]
[ ]
[ ]
[ ]

Anaerobic Soil Metabolism (162-2)
[S] >48 WEEKS IN LOAM SOIL, WITH
[ ] COMP. 104 AS MAJOR DEGRADATE.
[ ]
[ ]
[ ]
[ ]
[ ]

Anaerobic Aquatic Metabolism (162-3)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Aerobic Aquatic Metabolism (162-4)
[S] 77-170 DAYS, BUT DISSIPATION
[ ] IS NEGLIGIBLE AFTER 64 DAYS
[ ]
[ ]
[ ]
[ ]
[ ]

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Soil Partition Coefficient (Kd) (163-1)

	SOIL	%OM	Ka
[ ]	SAND	0.5	0.11
[V]	SdLm	1.4	0.62
[V]	LOAM	1.8	0.82
[V]	ClLm	2.0	1.82
[ ]	(Ka INCREASES WITH %OM)		

Soil Rf Factors (163-1)
[S] IN A 12" COLUMN OF FINE SAND
[ ] SOIL LEACHED WITH 20", THE
[ ] LEACHATE CONTAINED >94% OF
[ ] THE APPLIED.
[ ]
[ ]

Laboratory Volatility (163-2)
[ ]
[ ]

Field Volatility (163-3)
[ ]
[ ]

Terrestrial Field Dissipation (164-1)
[S] T1/2= 15 MONTHS IN AREAS OF MODERATE TO HEAVY RAINFALL,
[ ] AND UP TO 45 MONTHS IN LOW RAINFALL.
[S] >33 MONTHS IN LOAM (FRESNO, CA); 12-15 MONTHS IN CLAY SOIL
[ ] (LOUISIANA); 12-15 MONTHS IN LOAM (GREENFIELD, IN). MAJOR
[ ] DEGRADATE, COMPD 104, OCCURRED AT 3.9 TO 11.5% OF APPLIED
[ ] IN THE TIME PERIODS SHOWN.
[ ]
[ ]
[ ]
[ ]

Aquatic Dissipation (164-2)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Forestry Dissipation (164-3)
[ ]
[ ]

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Long-Term Soil Dissipation (164-5)
[ ]
[ ]

Accumulation in Rotational Crops, Confined (165-1)
[ ]
[ ]

Accumulation in Rotational Crops, Field (165-2)
[ ]
[ ]

Accumulation in Irrigated Crops (165-3)
[ ]
[ ]

Bioaccumulation in Fish (165-4)
[S] BLUEGILLS OR TROUT; BCF = 4 X AFTER 28 DAY EXPOSURE TO
[ ] 1 PPM. AFTER 14 DAYS DEPUR. IT WAS 3 X.

Bioaccumulation in Non-Target Organisms (165-5)
[ ]
[ ]

Ground Water Monitoring, Prospective (166-1)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Small Scale Retrospective (166-2)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Large Scale Retrospective (166-3)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Miscellaneous Data (158.75)
[ ] HAS BEEN FOUND IN SHALLOW GROUND WATERS IN TEXAS.
[ ]
[ ]

//

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Field Runoff (167-1)
[ ]
[ ]
[ ]
[ ]

Surface Water Monitoring (167-2)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Droplet Spectrum (201-1)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Field Evaluation (202-1)
[ ]
[ ]
[ ]
[ ]

Degradation Products

Tebuthiuron degrades slowly in soil to compound 104. Rate of degradation increases by optimizing microbial growth.

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Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
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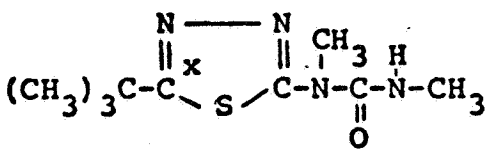
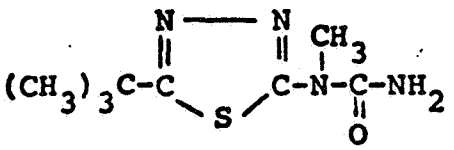
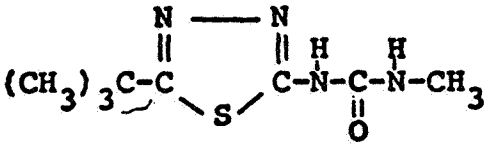
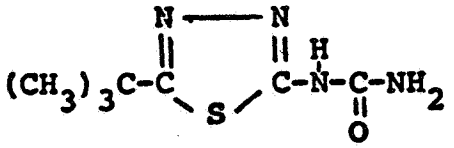
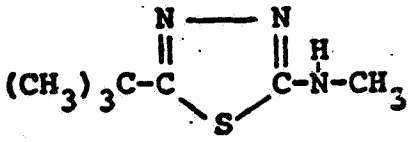
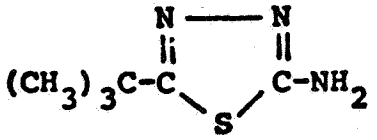
Comments

Even with a heavy rain and runoff event, only 10 ppb maximum was found in a pond a short distance from the watershed.
After 30 days aging in SdLm, 97% of radio. was present as parent.

Soil Koc = 4

References: EPA REVIEWS
Writer : PJH

Compound Designations, Structures, and Chemical Names of Reference Compounds

Compound Designation	Structure	Chemical Name
Tebuthiuron	 x - ^{14}C label	N-[5-(1,1-Dimethylethyl) 1,3,4-thiadiazol-2-yl]- N,N'-dimethylurea
104		N-[5-(1,1-Dimethylethyl) 1,3,4-thiadiazol-2-yl]- N-methylurea
105		N-[5-(1,1-Dimethylethyl) 1,3,4-thiadiazol-2-yl]- N'-methylurea
106		N-[5-(1,1-Dimethylethyl) 1,3,4-thiadiazol-2-yl]- urea
107		2-Dimethylethyl-5-methyl amino-1,3,4-thiadiazol
108		2-Dimethylethyl-5-amino- 1,3,4-thiadiazole